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**Aerospace Medicine**

**FRANCIS E. WARREN RADIATION  
PROTECTION PROGRAM**

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(Major Dena M. Maher)  
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This instruction establishes a radiation protection program at Francis E. Warren Air Force Base (FEW). The radiation protection program is further divided into the Ionizing Radiation Protection Program and the Non-Ionizing Radiation Protection Program. This instruction outlines responsibilities and procedures for conducting both programs resulting in increased protection of assigned personnel and the general public. It applies to all FEW units, tenant units, contractor operations, and all Missile Alert Facilities and Launch Facilities where radiation sources or radiation generating devices exist. Reference AFMAN 37-139, *Records Disposition Schedule*, for all documents being created and maintained; AFI 33-332, *Privacy Act* for all documents containing privacy act information; and DODR 5400.7\_Air Force Sup\_AFSPC Sup 1, Chap 4, for all documents containing *For Official Use Only* information. Glossary of References and Supporting Information may be found at [Attachment 1](#).

**SUMMARY OF REVISIONS**

**This Instruction Is Completely Revised To Update And Clarify Radiation Protection Guidance Requirements At FEW And Must Be Reviewed In Its Entirety.**

**1. Objective.** This instruction implements AFI 48-125, *The US Air Force Personnel Dosimetry Program*; AFI 48-148, *Ionizing Radiation Protection*; AFI 40-201, *Managing Radioactive Materials in the US Air Force*; and AFI 91-108, *Air Force Nuclear Weapons Intrinsic Radiation Safety Program*. It also implements AFOSH Standard 48-9, *Radio frequency Radiation (RFR) Safety Program* and AFOSH Standard 48-139, *Laser Radiation Protection Program* for non-ionizing radiation. The purpose of this instruction is to provide guidance for all commanders, radiation safety officers (RSO), and all personnel whose duties may involve exposure to radiation. The goal of the instruction is to protect workers and the general public from exposure to both ionizing and non-ionizing radiation and includes the concept of keeping exposures to radiation As Low As Reasonably Achievable (ALARA).

## 2. Ionizing Radiation Program.

2.1. **General.** The ALARA concept governs the FEW Ionizing Radiation Protection Program. This section of the instruction implements AFI 48-125, AFI 48-148, AFI 40-201, and AFI 91-108. Whenever the term “radiation” appears in this section, it is understood to mean “ionizing radiation” or radiation in that part of the electromagnetic spectrum, which is capable of producing ions, directly or indirectly, by interaction with matter.

2.2. **Application.** This guidance applies to all Air Force military and civilian personnel working at FEW whose duties require them to supervise work or work in areas where exposure to ionizing radiation may occur. It also applies to persons not occupationally exposed (general public) to the extent that it addresses controls to protect the public from potential hazards from sources of ionizing radiation owned or operated by the Air Force. This section also outlines requirements for contractors who bring ionizing radiation sources or equipment that produces ionizing radiation onto FEW. The guidance is not intended to apply to the exposure of patients by the Medical Services during diagnostic or therapeutic procedures, nor does it apply to radiation exposures resulting from the employment of nuclear or thermonuclear weapons in combat.

2.3. **Policy.** Air Force policy requires that all ionizing radiation exposures be ALARA. There should be no exposure to radiation without an expected benefit and the dose received should be the lowest possible, consistent with the state of technology, costs and operational requirements. Radiation exposures should be kept as far below existing standards as possible.

2.4. **Responsibilities.** The ALARA program requirements in this section apply to each functional area where radioactive materials or ionizing radiation producing devices are used and to each respective Radiation Safety Officer (RSO). This instruction tasks each RSO to perform the required tasks for his or her specific area of responsibility. The base RSO will coordinate with the respective unit and/or permit RSOs to ensure a comprehensive, coordinated base-wide radiation protection program.

2.4.1. Wing Commander. The Wing Commander is responsible for appointing, in writing, a base RSO and alternate. Recommendations are made to the Wing Commander by the 90 Medical Group Commander (90MDG/CC) to appoint the base Bioenvironmental Engineer (90 MDOS/SGOAB) as the base RSO.

2.4.2. Unit Commanders are responsible for appointing unit RSOs if there are actual or potential ionizing radiation hazards associated with the work their personnel accomplish or oversee. Written notification of unit RSO appointment and any subsequent changes must be submitted to the Bioenvironmental Engineering Flight (90 MDOS/SGOAB). **Attachment 2** contains a list of the organizations presently recognized as requiring unit RSOs for ionizing radiation. Any additions or changes to this listing should be reported to the base RSO, 90 MDOS/SGOAB, 773-3088:

2.4.3. Base RSO or designated representative will:

2.4.3.1. Conduct the radiation dosimetry in all designated functional areas in accordance with guidance established in AFI 48-125. The following areas on FEW AFB are routinely monitored with thermoluminescent dosimeters (TLD):

2.4.3.1.1. 90 MDSS/SGSAR: Diagnostic Imaging, Quarterly Exchange (Monthly for pregnant females).

2.4.3.1.2. 90 MDSS/SGSLR: Medical Equipment Repair, Quarterly Exchange (Monthly for pregnant females) .

2.4.3.2. Review and sign the dosimetry results Listing 1499, *Report of Occupational Exposure to Ionizing Radiation*, quarterly when received from AFIERA and obtain a signature from each individual monitored .

2.4.3.3. Review and sign dosimetry result Listing 1499 monthly when received from AFIERA to ensure the total dose to the fetus does not exceed 500 mrem during the term of the pregnancy.

2.4.3.4. Review and sign the AF Form 1527, **History of Occupational Exposure to Ionizing Radiation** when received annually from AFIERA and obtain a signature from each individual monitored.

2.4.3.5. Exchange the TLDs on the first working day of each quarter, or when replacement TLDs are received from AFIERA.

2.4.3.6. Maintain additional TLDs to be used for Broken Arrow response or other emergency situations requiring dosimetry. These TLDs will not be issued for routine monitoring in radiation areas already under surveillance.

2.4.3.7. Investigate radiation exposures above the following established action levels:

2.4.3.7.1. Overexposure Action Level. A personnel dosimetry result, which exceeds the maximum permissible dose, requires formal investigation and documentation of the incident IAW AFI 48-125.

2.4.3.7.2. Abnormal Exposure Action Level. A personnel dosimetry result, which, if continued on an annual basis, would result in an overexposure, requires formal investigation to determine the cause of the exposure IAW AFI 48-125.

2.4.3.7.3. Pregnant Female Action Level. A personnel dosimetry result which, if continues for the term of the pregnancy would exceed the maximum permissible exposure limit for the fetus, requires investigation and documentation of the findings. This information is reported to the Aerospace Medicine Council and the Combined Safety Council.

2.4.3.8. Conduct radiation surveys on a periodic basis in the following areas: 90 MDOS/SGOAB (Permit for NITON XRFs); 90 CES/CEX (Permit for Chemical Agent Monitors); 90 OG/AT-FP (General License for Vapor Tracer II devices); 90 SFS/SFTT (General License for Vapor Tracer II devices); 90 ADOS/SGGD (Dental X-ray equipment); 90 MDSS/SGSAR (Diagnostic Imaging X-Ray equipment); 90 MDSS/SGSLR (Medical Equipment Repair X-Ray equipment); 90 CES/CED (EOD X-ray equipment); 90 LRS/LGTT (Shipments of Radioactive Materials); 90 MMXS (Intrinsic Radiation in Nuclear Weapons). The survey will include review of any dosimetry results; physical layout of the work area; review of the radiation training folders; leak tests (if applicable); changes in operating procedures or equipment; placement of warning signs and labels; adequacy of reference material and TOs, as needed; radiation measurements with ADM 300 or scatter survey meter; and any other item required in accordance with current health physics practices.

2.4.3.9. Perform leak tests on permitted or licensed radioactive sources as required by permit or license. Leak test results will be maintained in the appropriate permit/license files.

2.4.3.10. Input lists of personnel who have received education and training on the concepts of ALARA and radiation protection into the Command Core Data Management System.

2.4.3.11. Document potential ionizing radiation exposures in the workplace on the AF Form 2755, **Master Workplace Exposure Data Summary**.

2.4.3.12. Conduct annual radiation program reviews and will document findings which will be presented to the Aerospace Medicine Council and Combined Safety Council.

2.4.4. Unit RSOs will:

2.4.4.1. Act as a single point of contact for the unit on ionizing radiation safety matters and provide information to the base RSO as needed .

2.4.4.2. Develop written Operating Instructions (OIs) which identify potential radiation hazards, controls in place that restrict personnel access to areas containing potentially hazardous ionizing radiation levels, and give procedures to be followed in the event of an accidental or suspected overexposure. Ensure a copy is provided to Civil Engineering Readiness (90 CES/CEX), Fire Department (90 CES/CEF), Security Forces (90 SFS/SFO) and the base RSO (90 MDOS/SGOAB).

2.4.4.3. Maintain the Listing 1499 in the workplace if personnel are enrolled in the TLD program.

2.4.4.4. Ensure personnel are identified to the base RSO (90 MDOS/SGOAB) for enrollment in the TLD program, if applicable.

2.4.4.5. Ensure TLDs are available for exchange on the day designated. Any lost, damaged, or suspected overexposed TLDs should be reported to the base RSO as soon as possible.

2.4.4.6. Ensure TDY personnel assigned to sections with TLD requirements are enrolled in the TLD program and are issued temporary TLDs if needed. If personnel from FEW go TDY to another installation, the unit RSO must notify the base RSO of this fact if the period of the TDY conflicts with the normal exchange frequency of the TLDs.

2.4.4.7. Conduct a quarterly review of all pertinent items included in paragraph [2.4.3.8](#) of this instruction, and document the findings in the unit AFOSH or radiation folder. This folder will be available to the Base RSO during periodic surveys. Any negative findings shall be reported to the base RSO immediately.

2.4.4.8. Develop and ensure unit personnel receive workplace specific ALARA training and radiation safety briefings. Ensure all ALARA training and briefing materials are reviewed and approved annually by the base RSO. Forward a list of those individuals within the unit who have received initial and annual training to the base RSO (90 MDOS/SGOAB) for input into the Command Core Data Management System .

2.4.4.9. Contact the base RSO to request initial, periodic, and special radiation surveys. All changes to location, operation characteristics or operating personnel must be reported to the base RSO immediately so that a survey may be accomplished, if necessary.

2.4.5. Permit/License RSOs will:

2.4.5.1. Ensure that all requirements outlined in the applicable permit or license are met.

2.4.5.2. Develop, and update as necessary, the listing of qualified users and supervisors for each permitted or licensed source and provide this information to the base RSO at least annually.

2.4.5.3. Forward applications for initial issue and renewal of existing permits/licenses to the base RSO (90 MDOS/SGOAB) in accordance with the procedures outlined in AFI 40-201. Allow at least 180 days for issuance of new permits and at least 90 days for renewal of existing permits. The unit RSO should review the permit application prior to it being forwarded to the base RSO.

## **2.5. Use of Radioactive Material by Outside Agencies or Contractors.**

2.5.1. Outside Agencies. Any FEW organization hosting another US Air Force or DoD unit to FEW to conduct work in which radioactive material or ionizing radiation producing equipment is to be used is required to coordinate and obtain written authorization from the base RSO prior to the invited unit physically bringing the said equipment on base.

2.5.2. Civilian contractors bringing a device that contains radioactive materials or that generates ionizing radiation onto FEW must have prior authorization from the base RSO. Base Contracting must ensure all civilian contractors are aware of this requirement.

2.5.3. An application to bring radioactive materials or ionizing radiation producing devices onto FEW must be forwarded to the base RSO (90 MDOS/SGOAB) at least 14 work days prior to the anticipated use. The authorization memo will state the length of time that the authorization is in effect, but under no circumstances will the authorization be for longer than one year. As a minimum, the application must include the following :

2.5.3.1. Copy of the appropriate NRC License or State Permit to operate/own the radioactive device.

2.5.3.2. Copy of the operator(s) qualifications and/or radiation safety training.

2.5.3.3. Radiation dosimetry results for the operator(s) for the prior calendar year, or a statement as to why no dosimetry results are available.

2.5.3.4. Equipment manufacturer specifications (source of radioactivity, model, serial numbers, etc.).

2.5.3.5. Statement of the expected start date and length of each project to be performed under the contract or project.

2.5.3.6. Statement of expected storage location and security requirements or other particular needs of the contractor or agency.

2.5.3.7. Copies of the last two leak checks (if appropriate).

2.5.4. The base RSO will provide a letter of approval/disapproval of the application to the requesting agency or contractor, with a courtesy copy to the base Fire Department (90 CES/CEF), Civil Engineering Readiness (90 CES/CEX), Security Forces (90 SFS/SFO), Ground Safety Office (90 SW/SEG), and Contracting (if contracted) (90 CONS/CC).

2.5.5. Under no circumstances will an unlicensed radioactive device be used on FEW. Any questions on a contractor or agency's responsibility in regard to this topic should be directed to the base RSO for resolution prior to starting work.

2.5.6. Contracting will ensure that all contracts contain a standard clause identifying the above requirements and that all contractors notify the contracting officer of their intent to use ionizing radiation producing equipment and/or equipment containing radioactive materials.

2.5.7. Contracting will ensure that all coordinated contractor requests, whether approved/disapproved, are received and properly filed with other contracting documents .

## **2.6. Facility Design Review.**

2.6.1. All plans for modification of facilities, or design of new facilities, which involve the use of radioactive materials or radiation producing devices must be reviewed by the base RSO to ensure ALARA is considered.

2.6.2. The review process and the signature of the Bioenvironmental Engineering (BEE), who is normally also the base RSO, will be sufficient for these requirements. The pre-design conferences and stages of design review (35%, 65%, and 95%) are critical in this process. It's the user's responsibility to inform the base RSO and Design Engineering that the project involves ionizing radiation and that ALARA must be considered. The base RSO will recommend engineering controls such as lead shielding if required to reduce the radiation exposures to ALARA .

## **2.7. Training.**

2.7.1. The unit RSO will conduct or arrange for radiation safety training for all individuals working in or frequenting any area where radioactive material or radiation producing devices are used. Initial training will be conducted before, or as soon as possible after, assignment to a work area where radiation exposure is possible. Annual refresher training courses will be conducted to reemphasize and reinforce training objectives. The level of training should be tailored to the specific category of personnel and the hazard presented. The respective unit RSO will maintain documentation of training and will forward a list of individuals trained to 90 MDOS/SGOAB for input into the Command Core Data Management System. Such training will, as a minimum, include instruction in the following areas:

2.7.1.1. Risk from radiation exposure.

2.7.1.2. Health risks to children of women who are occupationally exposed to radiation during pregnancy.

2.7.1.3. Maximum permissible dose limits.

2.7.1.4. Specific workplace protective measures required.

2.7.1.5. ALARA philosophy and practice.

2.7.2. The unit RSO will forward any training outlines or briefings to the base RSO (90 MDOS/SGOAB) for review and approval before presenting the training and annually thereafter.

2.7.3. The base RSO (90 MDOS/SGOAB) is available to provide assistance in developing workplace specific radiation protection training .

## **2.8. Quality Assurance.**

2.8.1. Quarterly Radiation Program Review. The base RSO will conduct a quarterly radiation program review and will document the findings to be presented to the Aerospace Medicine Council and Combined Safety Council. The review will include:

2.8.1.1. A review of all personnel dosimetry results for the previous quarter to identify adverse trends and ensure all personnel dosimetry results, which exceed action levels, are acted upon.

2.8.1.2. A review of all radiation survey results for the previous quarter to ensure all required surveys have been performed and documented properly, and that corrective action, if necessary, has been accomplished. In addition, exposures above the action level will be summarized in the quarterly review .

2.8.2. Annual Radiation Program Review. The base RSO will conduct an annual radiation program review and document the findings to be presented to the Aerospace Medicine Council and Combined Safety Council. The review will include:

2.8.2.1. A review of all local implementation directives (regulations and operating instructions) to ensure they are current.

2.8.2.2. A review of all radiation survey results for the past year to ensure all required surveys have been performed and documented properly and that corrective actions, if necessary, have been accomplished.

2.8.2.3. A review of personnel dosimetry results for the past year to identify adverse trends and ensure appropriate actions have been taken on results that exceed standards or action levels.

2.8.2.4. An update of the radiation source and radioactive material inventory.

2.8.2.5. A review of all USAF Radioactive Material Permits and NRC licenses to ensure currency and compliance with requirements.

2.9. **Emergency Information.** Contact Bioenvironmental Engineering at ext 3088 during normal duty hours or through the base paging system at 307-773-5168, pager number 216 to request emergency monitoring or to report suspected overexposures.

2.10. **Special Control Procedures for Radiation Sources.**

2.10.1. Shipping: The 90th LRS Distribution Office (90 LRS/LGTT) will assist shippers in preparing shipments in accordance with applicable directives depending on the mode of transportation. The 90<sup>th</sup> LRS Distribution Office will contact the base RSO to perform monitoring to ensure that exterior radiation levels on the surface of the container are below the acceptable level of 0.5 mrem per hour on any surface of the container.

2.10.2. Receiving. No damaged containers or containers with broken seals will be accepted from shippers.

2.10.3. Disposal.

2.10.3.1. Contact the base RSO prior to disposing or shipping of any radioactive materials or waste. Unusual circumstances will be reported in writing to the base RSO through the unit RSO.

2.10.3.2. Bioenvironmental Engineering (90 MDOS/SGOAB) will accomplish or arrange for characterization of wastes.

2.10.3.3. Disposal of low level radioactive waste generated by base units maintaining Department of Energy (DOE) weapon components shall be coordinated with AFIERA/RSA through the base RSO.

2.10.3.4. Storage. The base RSO will survey all storage areas before use. Follow-up surveys will be performed as determined by the base RSO. Results of the surveys will be maintained

for inspection by the base RSO during the annual radiation protection survey. Unusual circumstances will be reported to the base RSO. The base RSO will be notified immediately of any discovery of damaged containers or broken seals.

#### **2.11. Permits and Licenses.**

2.11.1. All radioactive sources in excess of exempt quantities must have a USAF permit or license.

2.11.2. A permit granted to the USAF as a whole covers radioactive check sources used with radiation survey equipment (such as PAC-1S, AN/PDR-27, Victoreen 440RF, ADM 300, etc.). Such items do not require further permitting at the local (base) level.

2.11.3. Consult with the base RSO prior to ordering or receiving any radioactive sources or ionizing radiation producing equipment. Written requests for possession and use of all radioactive sources must be coordinated through the base RSO. Forward the request to 90 MDOS/SGOAB.

### **3. Non-Ionizing Radiation Protection Program.**

3.1. **General.** Non-ionizing radiation as governed by this instruction includes both radio frequency radiation and laser radiation. This section of the instruction provides local guidance to implement the requirements of AFOSH Standard 48-9 and AFOSH Standard 48-139 for non-ionizing radiation .

3.2. **Application.** This guidance applies to all Air Force military and civilian personnel working at FEW whose duties require them to supervise work or work in areas where exposure to non-ionizing radiation may occur. It also applies to persons not occupationally exposed (general public) to the extent that it addresses controls to protect the public from potential hazards from sources of non-ionizing radiation owned or operated by the Air Force.

#### **3.3. Responsibilities.**

3.3.1. Unit Commanders are responsible for appointing unit RSOs if there are actual or potential non-ionizing radiation hazards associated with the work their personnel accomplish or oversee. Written notification of unit RSO appointment and any subsequent changes must be submitted to the Bioenvironmental Engineering Flight (90 MDOS/SGOAB). [Attachment 3](#) contains a list of the organizations presently recognized as requiring unit RSOs for non-ionizing radiation. Any additions or changes to this listing should be reported to the base RSO, 90 MDOS/SGOAB, 773-3088.

3.3.2. Bioenvironmental Engineering (90 MDOS/SGOAB) will:

3.3.2.1. Compile and maintain an inventory of all base radio frequency emitters and designated laser emitters.

3.3.2.2. Perform initial and periodic evaluations of all potentially hazardous radio frequency emitters and lasers to determine hazard distances and other required controls .

3.3.2.3. Assist the unit RSOs in conducting unit level non-ionizing radiation programs.

3.3.2.4. Assist the unit RSOs in developing and providing non-ionizing radiation training, as requested.

3.3.2.5. Conduct investigations of incidents of alleged or actual overexposures to non-ionizing radiation.



3.3.2.6. Input lists of personnel who have received education and training on the concepts of ALARA and radiation protection into the Command Core Data Management System.

3.3.2.7. Document potential non-ionizing radiation exposures in the workplace on the AF Form 2755.

3.3.2.8. Conduct annual non-ionizing radiation program reviews and will document findings which will be presented to the Aerospace Medicine Council and Combined Safety Council.

3.3.3. Unit RSOs will:

3.3.3.1. Act as a single point of contact for the unit on non-ionizing radiation safety matters and provide information to the base RSO as needed.

3.3.3.2. Develop written Operating Instructions (OIs) which identify potential non-ionizing radiation hazards, controls in place that restrict personnel access to areas containing potentially hazardous non-ionizing radiation levels, and give procedures to be followed in the event of an accidental or suspected overexposure. Ensure a copy is provided to Civil Engineering Readiness (90 CES/CEX), Fire Department (90 CES/CEF), Security Forces (90 SFS/SFO) and the base RSO (90 MDOS/SGOAB).

3.3.3.3. Conduct or arrange for non-ionizing radiation safety training for all individuals working in or frequenting any area where non-ionizing radiation hazards may exist. Initial training will be conducted before, or as soon as possible after, assignment to a work area where non-ionizing radiation exposure is possible. Annual refresher training courses will be conducted to reemphasize and reinforce training objectives. The level of training should be tailored to the specific category of personnel and the hazard presented. Ensure all non-ionizing radiation safety training and briefing materials are reviewed and approved annually by the base RSO. Documentation of training will be maintained locally by the respective unit RSO and a copy will be forwarded to 90 MDOS/SGOAB for input into the Command Core Data Management System.

3.3.3.4. Conduct an annual review of all pertinent items outlined in AFOSH Standard 48-9 and AFOSH Standard 48-139, and document the findings in the unit AFOSH or radiation folder. This folder will be available to the Base RSO during periodic surveys. Any negative findings shall be reported to the base RSO immediately.

3.3.3.5. Ensure that all radio frequency radiation emitters and lasers are recorded in the base non-ionizing radiation inventory. Provide all radio frequency emitter parameter information to Bioenvironmental Engineering (90 MDOS/SGOAB) for hazard distance calculation and hazard evaluation. Contact the base RSO to request initial, periodic, and special non-ionizing radiation surveys. All changes to location, operation characteristics or operating personnel must be reported to the base RSO immediately so that a survey may be accomplished, if necessary.

3.4. **Procedures.** Specific procedures and additional information regarding the requirements for non-ionizing radiation programs are clearly stated in AFOSH Standard 48-9 and AFOSH Standard

48-139. Consult the standards or contact Bioenvironmental Engineering (90 MDOS/SGOAB) for additional information if necessary.

THOMAS D. SHEARER, Colonel, USAF  
Commander, 90th Space Wing

**Attachment 1****GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION*****References***

US Nuclear Regulatory Commission (NRC) Regulatory Guide 8.10, *Operating Philosophy for Maintaining Occupational Radiation Exposures As Low As Reasonably Achievable*.

US Nuclear Regulatory Commission (NRC) Regulatory Guide 8.18, *Information Relevant to Ensuring That Occupational Radiation Exposures at Medical Institutions Will Be As Low As Reasonably Achievable*.

Department of Energy Report DOE/EV/1830-T5, Apr 84, *A Guide to Reducing Radiation Exposure to As Low As Reasonably Achievable (ALARA)*

AFI 40-201, *Managing Radioactive Materials in the US Air Force*

AFI 48-125, *The US Air Force Personnel Dosimetry Program*

AFI 48-148, *Ionizing Radiation Protection*

AFI 91-108, *Air Force Nuclear Weapons Intrinsic Radiation Safety Program*

AFOSH Standard 48-9, *Radio Frequency Radiation (RFR) Safety Program*

AFOSH Standard 48-139, *Laser Radiation Protection Program*

TECHNICAL ORDER 00-110N-2, *Radioactive Waste Disposal*.

TECHNICAL ORDER 00-110N-3, *Requisition, Handling, Storage, and Identification of Radioactive Materials*.

***Terms***

**ALARA Concept**—The “As Low as Reasonably Achievable” (ALARA) concept is defined as that set of management and administrative actions taken to reduce personnel radiation dose to as low a level as possible, consistent with existing technology, costs and operational requirements. The ALARA concept was developed in response to scientific evidence that suggests that no level of radiation exposure is totally risk free. While the established maximum permissible doses are conservative and offer a low risk of adverse health effects compared to other hazards of life and occupation, it is prudent that every effort be made to reduce exposures to the lowest level reasonably achievable, and thereby lower the health risk associated with that exposure.

**Base Radiation Safety Officer (RSO)**—The RSO is an individual designated by the 90th Space Wing Commander to manage radiation protection programs. This individual should be the base Bioenvironmental Engineer or Health Physicist, if assigned, but may be a Bioenvironmental Engineering Technician (AFSC 4BOX1) with appropriate training and experience. This individual will conduct the base-wide radiation protection program, which will include the surveillance of all radioactive materials and radiation producing devices. The Base RSO coordinates with and assists the Unit and Permit/License RSOs, as necessary, to ensure a comprehensive, coordinated radiation protection program.

**Dose Equivalent**—The REM (Roentgen Equivalent Man): The absorbed dose (measured in rads), which will produce a particular biological effect, varies considerably from one type of radiation to another. In

general, large particles, which produce many ionizations, are more effective in producing biological damage than are small particles or photons. Studies have shown that one rad resulting from alpha or neutron radiation results in greater biological damage (i.e., damage to soft tissue) than one rad of gamma or beta radiation. REM is the unit used to equalize the biological consequences, which result from equal absorbed doses of radiation. This is done by applying a "correction factor" to the rad value. This factor is called the Quality Factor (QF).

**Ionizing Radiation**—X-ray, gamma, alpha and beta radiation of sufficient energy to ionize material and cause biological damage .

**Non-ionizing Radiation**—Radiation emitted by lasers, radar, HF, UHF, VHF, microwave ovens and certain transmitting and test equipment, if there is sufficient energy and frequency to cause biological damage but not ionization of material.

**Permit/License RSO**—The individual designated by the unit commander, and approved by the USAF Radioisotope Committee or Nuclear Regulatory Commission (NRC) to manage the radiation protection aspects associated with the use of radioactive materials for which a specific USAF Radioactive Material Permit or an NRC License has been issued

**Radiation Safety Officer (RSO)**—The individual designated by the commander to manage radiation protection programs. The RSO provides consultation and advice on the hazards associated with radiation and the effectiveness of measures to control these hazards. This individual shall be the most technically qualified person available and should have specific education, training, and professional experience to assure a capability commensurate with the assignment. The term "Radiation Safety Officer" is a functional title and is not intended to denote a commissioned status or job classification within the Air Force. There are three distinct categories of RSO on FEW: Base RSO, Unit RSO, and Permit/License RSO.

**Radiation Source**—Naturally occurring or man-made isotopes that continuously emit ionizing radiation (Examples: Cesium 137, Plutonium 239, and Carbon 14).

**Thermoluminescent Dosimeter (TLD)**—Monitoring device worn by personnel exposed to ionizing radiation .

**Unit RSO**—The individual designated by the unit commander to act as the single focal point for the unit on radiation protection matters. Each operation unit, which operates radiation-producing devices, uses radioactive materials, or routinely works near radiation producing devices or radioactive materials will appoint a unit RSO. This individual coordinates radiation surveys and hazard evaluations with the Base RSO or the Permit/License RSO, assists in investigations of suspected or actual overexposures, and performed those radiation protection duties at the unit level which are commensurate with his/her training and experience.

**Attachment 2****ORGANIZATIONS PRESENTLY RECOGNIZED AS REQUIRING UNIT RADIATION  
SAFETY OFFICERS FOR IONIZING RADIATION**

Any additions or changes to this listing should be reported to the base RSO, 90 MDOS/SGOAB, 773-3088:

1. 90th Medical Support Squadron: Diagnostic Imaging (90 MDSS/SGSAR) (X-ray equipment).
2. 90th Medical Support Squadron: Medical Equipment Repair (MERC) (90 MDSS/SGSLR) (X-ray equipment repair).
3. 90th Medical Operations Squadron: Dental (90 MDOS/SGODD) (X-ray equipment).
4. 90th Medical Operations Squadron: Bioenvironmental Engineering (90 MDOS/SGOAB) (Niton XRF).
5. 90th LRS: Distribution Office (90 LRS/LGTT) (Shipments containing radioactive materials).
6. 90th Maintenance Squadron: Munitions Flight (90 MMXS/LGMW) (Minuteman/Peacekeeper missiles).
7. 90th Civil Engineering Squadron: Readiness Flight (90 CES/CEX) (Chemical Agent Monitors) .
8. 90th Civil Engineering Squadron: Explosive Ordnance Disposal (EOD) (90 CES/CED) (X-ray producing equipment).
9. 90th Security Forces Squadron: Training Section (90 SFS/SFTT) (Vapor Tracer II).
10. 90th Operations Group: Anti-Terrorism Force Protection (90 OG/AT-FP) (Vapor Tracer II).

**Attachment 3****ORGANIZATIONS PRESENTLY RECOGNIZED AS REQUIRING UNIT RADIATION  
SAFETY OFFICERS FOR NON-IONIZING RADIATION**

Any additions or changes to this listing should be reported to the base RSO, 90 MDOS/SGOAB, 773-3088:

1. 90 CS/SCMXR, Missile Radio
2. 90 CS/SCMXM, AFSAT Communications
3. 90 CS/RSI, Base Radio
4. 90 CS/SCMMT, Base & Information Security Systems (BISS)
5. 90 SFS/SFOL, Law Enforcement
6. 90 MDSS, Medical Readiness
7. 90 CES/CEX, Civil Engineering Readiness
8. 153 CACS/MAOMG, Ground Radio Maintenance